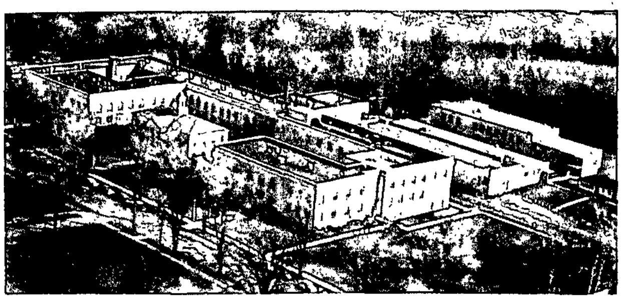

THE INSTITUTE OF PAPER CHEMISTRY, APPLETON, WISCONSIN

DEVELOPMENT OF AN IMPROVED DIFFUSION BOARD MATERIAL

Project 2256

Report Fifteen

A Monthly Report

to

U. S. ARMY CHEMICAL CENTER PROCUREMENT AGENCY

Report Period: February 5, 1962 to February 28, 1962

March 23, 1962

THE INSTITUTE OF PAPER CHEMISTRY

Appleton, Wisconsin

DEVELOPMENT OF AN IMPROVED DIFFUSION BOARD MATERIAL

Project 2256

Contract No. DA18-108-405-CML-941
DA18-108-CML-6561
Order No. CP 1-405-4519

Report Fifteen

Monthly Report

to

U. S. ARMY CHEMICAL CENTER PROCUREMENT AGENCY

Report Period: February 5, 1962 to February 28, 1962

March 23, 1962

Distribution:

Contract Project Officer
U. S. Army Chemical Research and Development Laboratories
Army Chemical Center, Maryland.
Att. of Mr. Grover C. Condon (22 copies)

Contracting Officer
U. S. Army Chemical Center Procurement Agency
Army Chemical Center, Maryland
Att. of Mr. W. E. Bankert (1 copy)

Commander, Armed Services Technical Information Agency (10 copies)
Arlington Hall Station
Arlington 12, Virginia
Attention: TIPDR

The Institute of Paper Chemistry

Central Files - 2 copies
T. A. Howells
E. J. Jones
L. E. Leporte

TABLE OF CONTENTS

THE INSTITUTE OF PAPER CHEMISTRY

Appleton, Wisconsin

DEVELOPMENT OF AN IMPROVED DIFFUSION BOARD MATERIAL

SUMMARY

The initial program has been extended to permit some additional laboratory work and to include two production runs and the preparation of a manufacturing directive. In preparation for the production run, tests on the effect of refining have been initiated and are covered in this report.

STATUS OF PROJECT

The original contract on this program expired on October 4, 1961. The production run originally contemplated had been postponed because of difficulties encountered in obtaining good tropical stability of the board with respect to protection against CK. On February 13, 1962 an extension of this contract was approved having as its purpose a continuation of the process study for further improvements in the general properties of the board with a minimum sacrifice of its protective characteristics, development of quality control tests, two production runs on full-scale equipment, and the preparation of a manufacturing directive. In accordance with the approval of this extension, experimental work has been resumed and this is the first monthly report covering experimental work under the new contract.

OUTLINE OF LABORATORY WORK

The renewed contract stipulates that a block of laboratory work will be carried out as groundwork for the commercial scale productions immediately following it. The intention of this work is to optimize the physical properties of the board at its present stage with the least sacrifice of its protective properties. On this basis, a program of laboratory work to cover gaps in the previous work and to reaffirm some of the results of previous work has been initiated. This program will be carried out according to the following schedule:

(1) Fiber characteristics. A relatively unrefined pulp obtained from the Wood Conversion Company will be evaluated at three degrees of refining; blends of refined stocks will also be used. Drainage rates for the refined stock will be determined with Canadian Standard and Green freeness testers and fiber classification will be determined with a screen classifier. Aquapel-Kymene sized boards, wet-pressed at three levels, will be formed from the refined and blended stocks. These boards will be subjected to the following tests: density, carbon dioxide diffusivity, smoke penetration, water absorption, beam strength, and wet and dry tensile strength.

(2) Fungicides. Of the fungicides previously evaluated, Cunilate 2419 and sequestered copper pentachlorophenate have shown the most promise. Aquapel-Kymene sized boards will be formed from a selected stock with additions of these materials at three levels. These boards along with sized blanks will be tested for gas life and mildew resistance.

(3) Stabilizers. Aquapel-Kymene sized boards will be formed with the incorporation of a commercially available grade of zinc oxide at three levels of addition. These boards will be tested for density, carbon dioxide diffusivity, gas life, water absorption, beam strength, and wet and dry tensile strength.

(4) Sizing. Boards will be formed with additions of Aquapel 360 and Kymene 557 at levels slightly above and slightly below the level presently in use (0.5% active Aquapel 360 and 0.2% active Kymene 557). These boards will be tested for density, carbon dioxide diffusivity, gas life, water absorption, beam strength, and wet and dry tensile strength.

(5) Charcoal content. Boards will be formed with optimum addition levels of sizing and zinc oxide and two levels of charcoal addition different than the 25% level presently in use. These boards will be tested for density,

carbon dixoide diffusivity, smoke penetration, gas life, water absorption, beam strength, and wet and dry tensile strength.

(6) Caliper. Boards will be formed with optimum sizing, stabilizer, fungicide, and charcoal additions at two calipers differing from the present range of calipers. These boards will be tested for density, carbon dioxide diffusivity, gas life, beam strength, and wet and dry tensile strength.

EFFECT OF REFINING

A quantity of lightly refined pulp was received from the Wood Conversion Company. Portions of this pulp were refined in a laboratory Sprout Waldron refiner at the Institute at settings of 0.001, 0.015, and 0.030 inch between the refiner plates.

Bauer, McNett fiber classification (IPC Method 415) and Green and Canadian Standard freeness tests were run on samples of the pulps. A 3-gram ovendry fiber charge was used in the Canadian Standard freeness tests and a 5-gram ovendry fiber charge was used in the Green freeness tests. The results of these tests are presented in Table I. An inconsistency was noted in the results of these tests in that the freeness of the pulp refined at a 0.015-inch plate setting was higher than the freeness of the pulp refined at a plate setting of 0.030 inch; however, the fiber classification and the densities of boards formed from these pulps bear out the freeness values. Evidently, this inconsistency represents a lack of controllability in the operation of the laboratory Sprout Waldron or an error in the adjustment of the plates.

These pulps and two blends, one consisting of 50% pulp refined at a 0.001-inch plate setting and 50% pulp refined at a 0.030-inch plate setting and the other consisting of 70% as received pulp and 30% pulp refined at a 0.001-inch plate

TABLE I

EFFECTS OF REFINING ON WOOD CONVERSION COMPANY ASPEN PULP
REFINED IN A SPROUT WALDRON AT VARIOUS SPACINGS BETWEEN REFINER DISKS

Pulp Designation	Refining (spacing between disks), in.	Bauer-McNett Fiber Classification, IPC Method 415					Green Freeness, 5 g. o.d. sample, cc.	Canadian Freeness, 3 g. o.d. sample, cc.
		On 12 Mesh, %	Thru 12 on 28, %	Thru 28 on 48, %	Thru 48 on 100, %	Thru 100 by Diff., %		
2256-150	"as received"	48.92	17.21	9.70	7.04	17.13	695	790
2256-152	0.001	16.08	27.27	19.97	11.99	24.69	595	695
2256-154	0.015	24.05	24.81	17.09	10.44	23.61	630	710
2256-156	0.030	25.58	25.09	17.91	10.78	20.64	610	700

setting, were formed into boards using three levels of wet pressing. It was necessary to make additional refiner runs to obtain pulps for use in the blends. Although the second refiner runs were made at the same settings as the first runs, it is not certain that these pulps are duplicates of their initial counterparts as no tests have been made on them at this time. The calipers, densities, and carbon dioxide diffusivities of the boards are presented in Table II.

Board densities are plotted as a function of Green freeness in Fig. 1 and the relationship between density and carbon dioxide diffusivity is shown for each of the pulps in Fig. 2. Figure 2 indicates that there is some difference in the relation of density to diffusivity that is dependent on the individual pulps. Possibly the diffusivity is somewhat affected by proportions of coarse and fine material in the pulp; however, sufficient data are not yet available to provide any quantitative conclusions.

TABLE II

EFFECTS OF REFINED WOOD CONVERSION COMPANY PULP ON DIFFUSION BOARD

Sample No.	Pulp Designation	Refiner Setting, in.	Wet Pressing, p.s.i.	Av. Caliper, in.	Density, lb./cu.ft.	CO_2 Diffusivity, 10^{-2} sq.cm./sec.
2256-151-1	2256-150	unrefined	100	0.311	19.93	2.73
-2	" "	"	150	0.295	21.52	2.40
2256-153-1	2256-152	0.001	150	0.266	26.01	1.89
-2	" "	0.001	150	0.266	25.90	1.86
-3	" "	0.001	100	0.288	23.30	2.16
-4	" "	0.001	100	0.294	23.81	2.16
-5	" "	0.001	50	0.322	21.91	2.60
-6	" "	0.001	50	0.327	21.02	2.80
2256-155-1	2256-154	0.015	150	0.275	25.00	2.21
-2	" "	0.015	150	0.279	24.28	2.18
-3	" "	0.015	100	0.293	23.29	2.41
-4	" "	0.015	100	0.291	23.40	2.45
-5	" "	0.015	50	0.334	20.38	2.87
-6	" "	0.015	50	0.329	20.73	2.93
2256-157-1	2256-156	0.030	150	0.269	24.98	2.13
-2	" "	0.030	150	0.269	25.02	2.07
-3	" "	0.030	100	0.300	23.33	2.43
-4	" "	0.030	100	0.300	23.09	2.45
-5	" "	0.030	50	0.334	20.90	2.83
-6	" "	0.030	50	0.333	20.59	2.83

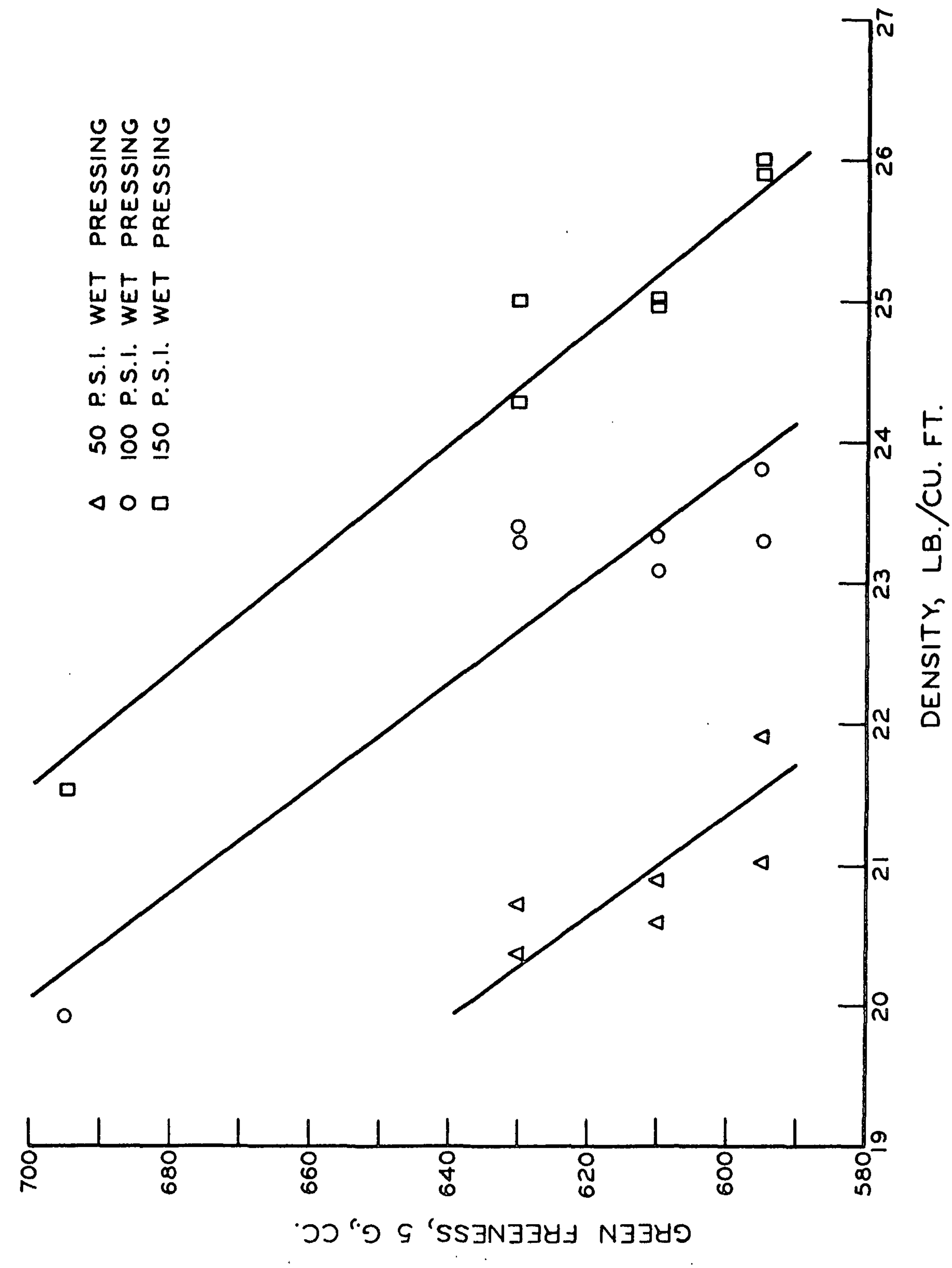

Figure 1. Effect of Green Freeness on Board Density for Wood Conversion Company Pulp Refined in a Sprout Waldron Disk Refiner

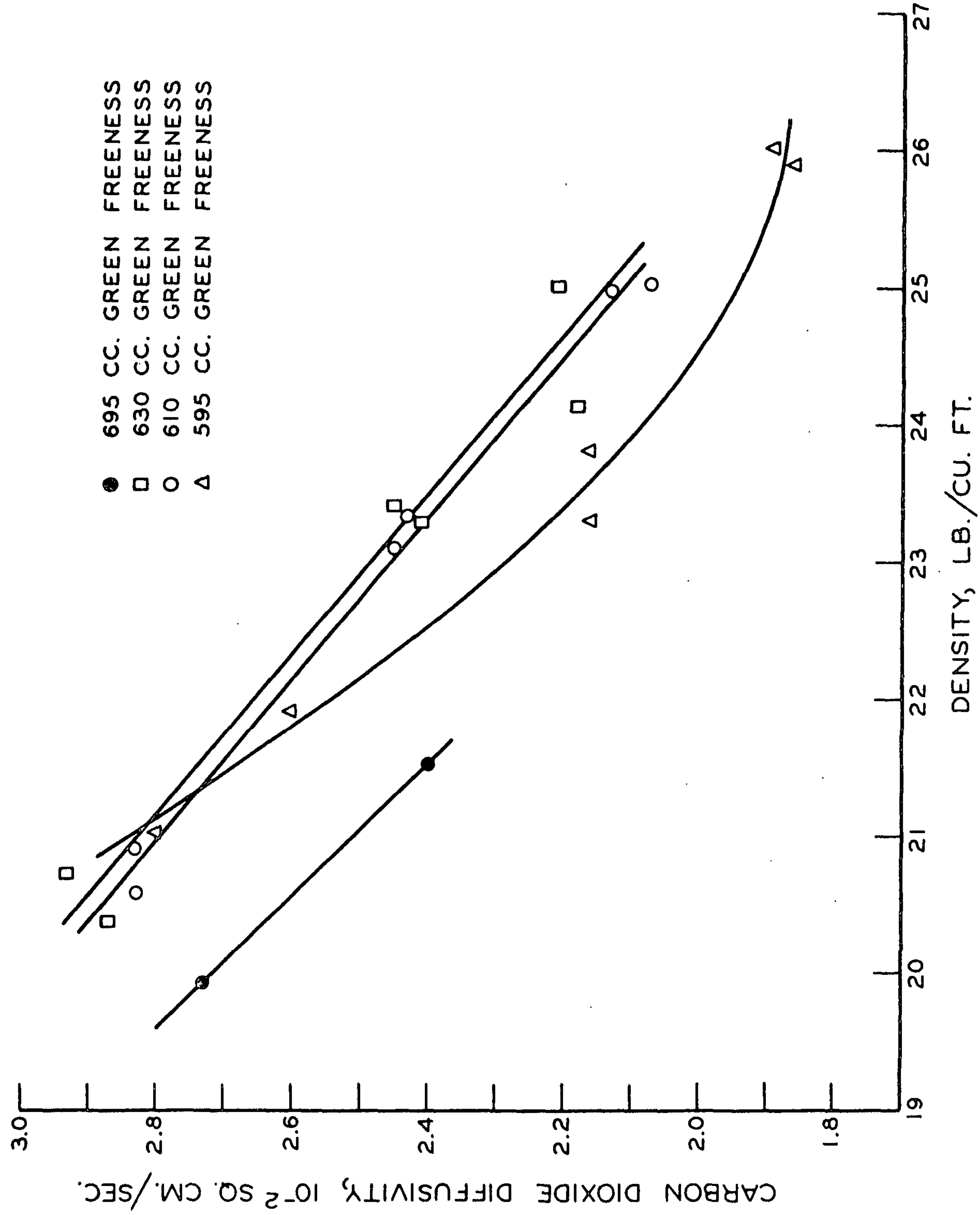

Figure 2. Carbon Dioxide Diffusivity as a Function of Density for Boards Formed From Wood Conversion Company Pulp Refined in a Sprout Waldron Disk Refiner

THE INSTITUTE OF PAPER CHEMISTRY

L. E. Leporte

L. E. Leporte, Research Aide

T. A. Howells

T. A. Howells, Chief
Special Processes Section